

# Notice of Allowability

Application No.

10/613,885

Examiner

Eric M. Gibson

Applicant(s)

HUANG, BAOJIA

Art Unit

3661

## -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 3/1/2006.
2. ☒ The allowed claim(s) is/are 45-61.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All b) ☐ Some\* c) ☐ None of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

### Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

THOMAS G. BLANK  
PERMISSORY PATENT EXAMINER  
GROUP 3800

### **EXAMINER'S AMENDMENT**

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

Cancel claims 1-44 and replace with new claims 45- 61.

45. A vehicle collision avoidance system comprising:

a circumferentially rotating pulsed infrared laser beam scanner apparatus including a laser pulsed emitter and an infrared laser sensor for generating a first signal representative of an obstacle scanned, the laser pulsed emitter rotating circumferentially in a horizontal plane and a vertical plane simultaneously, the infrared laser sensor circumferentially rotating synchronously with the laser pulsed emitter in the horizontal plane and receiving a reflected laser beam signal from the obstacle scanned;

wherein the laser pulsed emitter is emitting a laser beam signal over a 360° field of view and the infrared laser sensor is receiving the reflected laser beam signal over the 360° field of view;

a processing circuit coupled to the circumferentially rotating pulsed infrared laser beam scanner apparatus for processing the first signal and generating a plurality of signals;

a processor coupled to the processing circuit for processing the plurality of signals and generating a braking signal; and  
a braking apparatus responsive to the braking signal.

46. The vehicle collision avoidance system of claim 45, wherein the circumferentially rotating pulsed infrared laser beam scanner apparatus is operable to scan an object from 1.6m to 120m.

47. The vehicle collision avoidance system of claim 45, wherein the circumferentially rotating pulsed infrared laser beam scanner apparatus rotates in the horizontal plane at 48 revolutions per second and with a period of 20.83ms and in the vertical plane at 8 sectors per second and a period of 20.83ms.

48. The vehicle collision avoidance system of claim 45, wherein the circumferentially rotating pulsed infrared laser beam scanner apparatus emits a laser beam having 28.45W peak power, an average power of 142mW, a wavelength between  $1\mu\text{m}$  and  $1.550\mu\text{m}$  excluding the region between  $1.3\mu\text{m}$  and  $1.4\mu\text{m}$ , and preferably between  $1.450\mu\text{m}$  and  $1.550\mu\text{m}$ , a 1.0ns to 1.25ns pulse width, a 10Mhz to 110Mhz repetition rate, and a 0.002 radian emitting pulsed laser beam divergent angle.

49. A method of avoiding a vehicle collision comprising:

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determining features of an obstacle using a circumferentially rotating pulsed infrared laser beam scanner apparatus including a laser pulsed emitter and an infrared laser sensor for generating a first signal representative of the obstacle scanned, the laser pulsed emitter rotating circumferentially in a horizontal plane and a vertical plane simultaneously, the infrared laser sensor circumferentially rotating synchronously with the laser pulsed emitter in the horizontal plane and receiving a reflected laser beam signal from the obstacle scanned;

wherein the laser pulsed emitter is emitting a laser beam signal over a 360° field of view and the infrared laser sensor is receiving the reflected laser beam signal over the 360° field of view;

processing signals representative of the determined features, and

braking the vehicle in the event the processed signals indicate an imminent collision.

50. The method of avoiding a vehicle collision of claim 49, wherein the circumferentially rotating pulsed infrared laser beam scanner apparatus emits a laser beam having 28.45W peak power, an average power of 142mW, a wavelength between 1 $\mu$ m and 1.550 $\mu$ m excluding the region between 1.3 $\mu$ m and 1.4 $\mu$ m, and preferably between 1.450 $\mu$ m and 1.550 $\mu$ m, a 1.0ns to 1.25ns pulse width, a 10Mhz to 110Mhz repetition rate, and a 0.002 radian emitting pulsed laser beam divergent angle.

51. A method of avoiding a vehicle collision comprising:

circumferentially detecting bodies proximate the vehicle using a circumferentially rotating pulsed infrared laser beam scanner apparatus including a laser pulsed emitter and an infrared laser sensor for generating a first signal representative of a body scanned, the laser pulsed emitter rotating circumferentially in a horizontal plane and a vertical plane simultaneously, the infrared laser sensor circumferentially rotating synchronously with the laser pulsed emitter in the horizontal plane and receiving a reflected laser beam signal from the body scanned;

wherein the laser pulsed emitter is emitting a laser beam signal over a 360° field of view and the infrared laser sensor is receiving the reflected laser beam signal over the 360° field of view;

obtaining data from the circumferentially rotating pulsed infrared laser beam scanner apparatus including a time when the beam reaches a first edge of each body and a time when the beam reaches a second edge of each body;

determining a relative distance from the scanner apparatus to each body;

determining a time to collision with each body; and

determining a braking force to avoid a collision with each body.

52. The method of avoiding a vehicle collision of claim 51, further comprising determining a critical point at which an absolute value of the derivative of each bodies acceleration with respect to time approaches zero.

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53. The method of avoiding a vehicle collision of claim 52, wherein determining the relative distance and determining the time to collision are initiated at the critical point.

54. The method of avoiding a vehicle collision of claim 51, further comprising determining a relative angular velocity of each body.

55. The method of avoiding a vehicle collision of claim 51, wherein determining the time to collision comprises computing a second order factor.

56. The method of avoiding a vehicle collision of claim 51, further comprising determining the bumpiness of a road surface.

57. The method of avoiding a vehicle collision of claim 56, wherein determining the braking force to avoid a collision with each obstacle comprises determining a first braking force in a case where the time to collision is less than 1.5 seconds and a second braking force in a case where the road is bumpy.

58. The method of avoiding a vehicle collision of claim 51, wherein determining the time to collision further comprises determining vertical and horizontal components of each body.

59. The method of avoiding a vehicle collision of claim 51, further comprising determining a rate of approach of the vehicle and each body.

60. The method of avoiding a vehicle collision of claim 51, wherein the obtaining and determining steps are performed in a point-to-point vector processing manner.

61. The method of avoiding a vehicle collision of claim 51, further comprising using an analog circuit to process the time when the beam reaches the first edge of each body and the time when the beam reaches the second edge of each body, the relative distance from the scanner apparatus to each body, a relative angular velocity of each body, an acceleration of each body, and a derivative of the acceleration.

### ***Reasons for Allowance***

Claims 45-61 are allowed.

The following is an examiner's statement of reasons for allowance:

The Examiner and the Applicant discussed the invention and the prior art as described in the Interview Summary mailed on 7/29/2006. During the discussions, the Examiner and the Applicant were able to isolate the distinctive feature of the invention over the prior art. Specifically, the prior art does not teach or reasonably suggest in combination the use of a circumferentially rotating pulsed infrared laser beam scanner apparatus including a laser pulsed emitter and an infrared laser sensor for generating a

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first signal representative of a body scanned, the laser pulsed emitter rotating circumferentially in a horizontal plane and a vertical plane simultaneously, the infrared laser sensor circumferentially rotating synchronously with the laser pulsed emitter in the horizontal plane and receiving a reflected laser beam signal from the body scanned, wherein the laser pulsed emitter is emitting a laser beam signal over a 360° field of view and the infrared laser sensor is receiving the reflected laser beam signal over the 360° field of view.

This allowable feature is included as a limitation incorporated into independent claims 45, 49, and 51. Claims 46-48, 50, and 52-61 serve to further define the invention over the prior art.

The Examiner's Amendment replacing the Applicant-submitted claims was necessary to properly incorporate the limitations as discussed with the Applicant on 7/29/2006, to clear up any remaining indefiniteness or other claim objections, and to provide a clean copy of the claims for entry.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric M. Gibson whose telephone number is (571) 272-6960. The examiner can normally be reached on M-F.

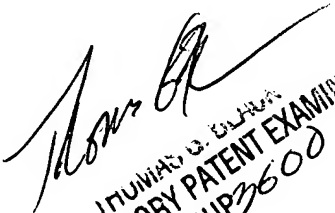


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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas Black can be reached on (571) 272-6956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

EMG

  
THOMAS D. BLACK  
SUPERVISORY PATENT EXAMINER  
GROUP 3600